Vintage aus Jena (Zeiss Jena, Carl Zeiss Jena) 2x binocular surgical loupes as used for eye surgery

Use, Design & Specifications:

Surgical binocular loupes have been used by generations of eye surgeons. Although now replaced by the operating microscope when performing modern cataract surgery[1], they are still used by eye surgeons particularly during eye muscle and eyelid surgery.

When in good condition, these elegantly designed loupes with metal frame (Photo 1) are still very functional even decades after manufacture.

Photo 1 showing front view of vintage Zeiss Jena loupes and case

Because these loupes are compact and low-profile, users can easily look over, under or around the loupes for a non-magnified view. Their lightweight combined with the "wrap around the ear" cable temples enable comfortable prolonged wear.

They are also used by others who require "hands-free" magnification for meticulous near work, such as surgeons where surgery is performed at a relatively short near working distance, watchmakers, jewellers and hobbyists.

The metal frames and optics are lightweight (about 40 grams for the loupes shown in Photo 1) and measure 127 mm from one temple joint to frame to the other, with a temple length of 107 mm from the temple joint to frame to the farthest part of the curved "wrap around" earpiece.

The Galilean loupe optics were renowned for their superb stereoscopic magnification which was sharp to the edges and with minimum chromatic aberration. The magnification is 2x power although a later manufactured model was of 2.3x.[2,3] The field of view is approximately 50 mm

and the focal distance is approximately 25 cm, but this will depend upon the wearer's refractive error and whether auxiliary slip-on lenses are used (as described below).

The interpupillary distance is adjustable from 58 to 72 mm. Each optic barrel needs to be independently adjusted, by loosening the knobs on the front slide frame and sliding each optic barrel to center the magnified image in each eye, and then retightening the knobs. The brochure dated 1970 from Carl Zeiss Jena suggests calibration by viewing a cross-line drawing at near and adjusting the interpupillary distance to eliminate double vision, color fringing and blur, and to maximize sharpness.[2]

OEM Accessories: Case

The loupes have an OEM leather case (Photo 1) that is brown on the outside, and with a velvet lining on the inside on the side with the flap and opposite inside, wisely protecting the optic lens surfaces when the loupes are slid into the case. The case measures 140 mm long, 50 mm wide and 50 mm in depth, and weighs about 90 grams.

OEM Accessories : Attachable Frame for Prescription Spectacle Lenses

Two sturdy frames in matching metal which can be fit with the wearer's prescription spectacle lenses and which attach firmly to the narrow end of the barrel of each loupe optic. Photos 2, 3 and 6 show these spectacle frames (fit with prescription lenses) separated from, and then attached to, the loupes. It is important that the prescription lenses be properly orientated in the attachable frames and this can be guided by the orientation of their struts, as described below. The two attachable lens frames with lenses shown in Photo 2 weigh about 22 grams combined.

Photo 2 Showing attachable lens frames with prescription straight top trifocal lenses

Photo 3 Showing top view of spectacle mounts attached to narrow ends of optic barrels

If the wearer is emmetropic (i.e. no need for glasses for distance viewing), these attachable frames are not required. If the wearer has a low degree of myopia or hyperopia (probably 2 diopters or less, without significant astigmatism), it may be possible to wear the loupes without prescription correction, but doing so does influence the working distance (lengthening for hyperopia and shortening for myopia). But if the wearer is significantly ametropic (requiring a significant correction for distance viewing, especially astigmatism) then an optical lab can cut, edge and insert new prescription lenses either using the template of the attachable frames or by using any lenses already present in, and removed from, the frames. The prescription lenses can be removed/inserted by loosening the screw clamp (located inferiorly in Photo 2) located on the edge of each spectacle frame.

Removal of the attachable lens frame from the narrow end of the optic barrel is achieved by using a precision straight screwdriver to loosen (and likely remove) the screw located in the clamp on one side of the round part of the spectacle frame attachment; then carefully sliding this round mounting over the narrow rear end of the optic barrel, clearing the spike on the narrow end of the optic barrel (shown in photo 4) from the corresponding small hole on the round part of the spectacle mounting frame. To reinsert the round part of the spectacle frame attachment, reverse the process (inserting the spike through the *small* hole on the round part of the spectacle frame attachment) and sliding it over the rear of the loupe barrel, then retightening (or reinserting) the clamping screw on the other side of the round part of the spectacle frame attachment.

Photo 4 showing spike on narrow end of optic barrel

The optic barrels can themselves be rotated in the loupe frame to properly orientate the spectacle lenses by loosening the screw on the loupe frame itself (located just to the outside of the optic barrel), rotate the barrel, then retighten. The proper orientation of the spectacle lenses in the attachable frames should be decided ***before*** the optical lab cuts the prescription lenses to determine in which direction the struts on the lens metal frames will be orientated (obliquely as shown in Photo 2; horizontally as shown in Photo 6; or vertically).

When the wearer becomes presbyopic (when one starts to require "reading glasses" to see clearly at near, usually starting at the early 40's of age), prescription lenses to enable clear near vision can be cut, edged and inserted by an optical lab. Photo 2 shows "executive style" trifocals (straight tops extending across the entire lens) with plano, +1.5 D, and +3 D power from top to

bottom for an emmetropic but presbyopic wearer. Such trifocals would allow a clear image when looking in the distance through the top segment of the spectacle lens, a clear image at 66 cm when looking at near through the middle segment, and a clear image at 33 cm when looking at near through the bottom segment.

In earlier times, and rather than these large spectacle lenses in attachable frames, "small corrective lenses for distance" were "slipped on to the *eye-side* of the magnifier system".[2,4]

OEM Accessories: "Slip-on" lens caps to alter the working distance

Auxiliary lens caps slipped onto the front of the loupe barrels were designed to change the working distance of the loupes: the first for increasing the working distance of the loupes from 250 mm to 330 mm, and the second for reducing the working distance from 250 mm to 200 mm.[3]

Photo 5 shows rear and front views of a slip-on auxiliary lens cap purchased in 1976 to increase the working distance on loupes with 2x magnification.

Photo 5 showing rear and front views of slip-on lens cap used to extend working distance

The power of the auxiliary lenses in these slip-on cap each measure minus 2 diopters but also with 4 prism diopters of ground-in prism. The small arrowhead mark on the outside of the cap denotes the direction of the ground in prism, with the intent that these auxiliary lenses are to be slipped onto the wide front of the optic barrels with the arrowheads facing outward, then, if necessary, the slip-on lens caps are rotated until the magnified images from each eye are fused. Use of these auxiliary lens caps to increase the focal working distance to 330 mm will reduce magnification from 2x to approximately 1.8x (and slightly expand the field of view). Photo 6 shows how the lens caps fit onto the wide outside barrels of the optic barrels, although the lens caps have been rotated to highlight the arrowheads. The combined weight of two slip-on auxiliary lens caps is about 7 grams.

Photo 6 showing lens caps, with arrowheads indicating prism direction, slipped onto front of optic barrels

Other OEM modifications:

There were two other models of loupes with the same optic barrel design and interpupillary adjustment slide, but *without* the metal temples and cable earpieces. One model had an ingenious hinged attachment system designed to be mounted on the nasal bridge of a celluloid spectacle frame and which allowed the loupes to be flipped up.[2] Another model had two strut screw mounts designed to be placed through holes drilled nasally into each spectacle lenses, tightened and worn with suitable spectacle frames.

Manufacturer Branding Inscriptions:

Legal disputes regarding trademarking resulted in confusion as to location of manufacture.[5] After WWII, the East-German Zeiss products were labelled "*ZEISS JENA*" or simply "*JENA*" for sale in Western countries. But in the United States, the East-German products manufactured by the Jena firm were marketed only under the "aus JENA", "JENOPTIK" or "JENOPTIK JENA" trademarks. Yet the "CARL ZEISS JENA" trademark appeared on East German products sold in Canada, England, Switzerland, Japan and the former communist block nations! West-German Zeiss products for sale in Eastern bloc countries were labelled "*ZEISS-OPTON*" (and later renamed "*CARL ZEISS*").

The loupes shown in Photo 3 are inscribed on the optic loupe barrels with "aus JENA 2x MADE IN GERMANY EAST" (aus means "from") indicating that it was manufactured in east Germany by Jena (after WWII from 1945 onward). The loupes shown in Photo 7 (and purchased new in 1976 in Canada) are inscribed with "CARL ZEISS JENA 2x DDR" (clearly denoting that they were manufactured in East Germany), and those shown in Photo 8 are inscribed with "CARL ZEISS JENA 2x MADE IN GERMANY". All three appear to be of the same construction.

Photo 7 showing CARL ZEISS JENA 2x DDR inscription on optic barrels

Photo 8 showing CARL ZEISS JENA 2x MADE IN GERMANY inscription on optic barrels

References:

1) Chaim Edelstein Chaim Kwitko Marvin L. Chapter “History of the Operating Microscope” in the book entitled *The History of Modern Cataract Surgery* edited by Kwitko Marvin L and Kelman Charles D, published in 1998 by Kugler, The Hague, The Netherlands

2) Brochure No. 62-310 d-2 (entitled "Magnifier spectacles") supplied by ZEISS Archives, ID 53232 which dates to 1970

3) Brochure No. 50-720-2 (entitled Binocular loupe with 2,3x magnifying) supplied by ZEISS Archives 53232 and dates to 1984

4) Schmitz E. H. (1984). Handbook on the History of Optics, Volume 4 Part A: The Step into the 20th Century, J.P. Wayenborgh Publishing House, p335 [translated from Schmitz, E.-H., (1984), *Handbuch zur Geschichte der Optik, Band 4 Teil A der Schritt in Das XX. Jahrhundert*, p335]

5) Allison, Richard C.: The Carl Zeiss Case (S. 525-535). Zur Entscheidung des US District Court for the Southern District of New York 1962.